Intrepid Computing

A Vision to Enable the Next One Billion

Enabling the Next One Billion

VIA Technologies, Inc.
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Illustrations

Introduction

ICT (Information and Communication Technology) has had a profound effect on global economic and social development in the past twenty years. But despite the recent rapid growth in the deployment of PCs and broadband Internet connectivity, the current global PC usage rate still stands at just around 15% of the total world population - and is considerably lower than that in Emerging Markets such as China, India, Russia, Eastern Europe, and South America.

Further expanding PC and Internet usage is critical not only for increasing individual and national economic competitiveness, but also in enabling countries to strengthen their commercial, social, educational, healthcare, and government infrastructures by extending access to information and other online resources as well as enhancing transparency.

Achieving this goal, however, requires a fresher, bolder, and much more radical approach than simply driving down PC prices: one that takes computing technology beyond the traditional confines of the standard PC into new markets, new environments, new usage models and new product categories. In short, this is the VIA Intrepid Computing Vision.

VIA is implementing its Intrepid Computing Vision through the VIA pc-1 Initiative, the company's comprehensive global strategic initiative aimed at enabling the next one billion users. There are a number of critical challenges that will need to be overcome if we are to achieve this ambitious objective. In addition to describing and analyzing these challenges, this document shows how VIA is working to tackle them through the VIA pc-1 Initiative and its Intrepid Computing Vision.

Intrepid Computing: A New Approach to New Markets

Despite two decades of rapid PC sales growth and continuous cuts in prices to as low as $250 for a system, the levels of global PC and broadband usage still remain low, particularly in Emerging Markets.

The India PC market, for example, currently stands at only four million units per year, with a PC usage rate of less than 4% of the total population. Even in China, where the PC market is much larger at 14 million units per year, the estimated total PC user base still stands at less than 10% of the overall population, and usage rates are even lower in other regions such as South America and Africa.

Boosting the levels of PC and Internet usage requires a fresher and bolder approach that will not only spur innovation in new products and usage models to meet the diverse requirements of the next one billion users, but will also lead to the creation of the appropriate government, business, and service ecosystems needed to support them. This section looks at the four most critical challenges that need to be overcome in order to achieve this objective, namely:

- **New Markets**: Beyond Ownership to Access
- **New Environments**: Beyond City Comfort to Rural Remoteness
- **New Usage Models**: From "One-to-One" to "One-to-Many"
- **New Products**: From PCs to PHD Appliances

New Markets: Beyond Ownership to Access

While lower price points have helped to drive rapid growth in PC usage over the past five years, the reality is that, even at $250 for a fully-configured system, computers are far out of reach for the vast majority of potential users due to their low annual incomes.

The VIA Intrepid Computing vision looks to expand usage through a different approach, that of extending beyond the **Individual Ownership** concept to that of **Community Access** and, further, to that of **Assisted Access**.

Therefore, while the cost of systems has to continue to go down in order to boost **Individual Ownership** of PCs, innovative new usage models such as pay-for-use schemes in Internet Cafés and Village Kiosks also need to be implemented in order to increase **Community Access** to the benefits of ICT. Such schemes need to be self-sustaining in economic terms by providing value generation opportunities for local entrepreneurs. However, in impoverished and remote areas, **Assisted Access** models funded by government organizations and NGOs are required in order to bring digital news and information to the local population.

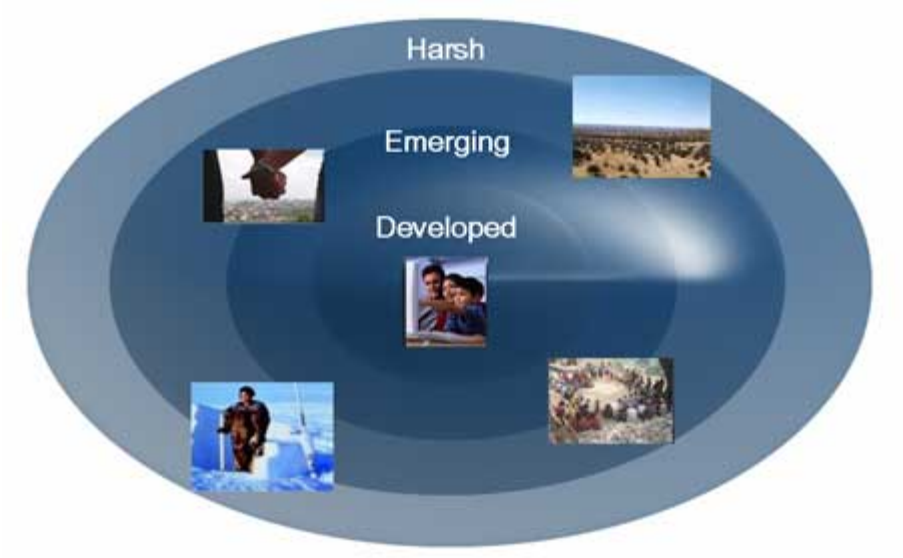
Figure 1: Expansion beyond Ownership to Access

New Environments: Beyond City Comfort to Rural Remoteness

Expanding PC and Internet usage beyond the comfort of developed urban areas into more remote rural districts with limited infrastructure and tough environmental and climatic conditions poses multiple challenges, not just in terms of technology and product requirements but also in enabling affordable last-mile connectivity.

The VIA Intrepid Computing Vision requires thinking beyond the standard desktop PC to the rural village Internet Café, and even further beyond to remote communities.

Figure 2: Expansion beyond Developed Environments



Systems targeted at such markets need to be reliable and robust enough to operate in even the harshest environmental and climatic conditions where heat and dust can be major problems. The systems also have to be highly energy-efficient in order to reduce the burden on the electricity generation infrastructure and they need to feature support for alternative power sources such as car batteries in places that do not receive a constant supply of electricity.

Providing affordable Internet connectivity is also a major issue that needs to be addressed, particularly in some Emerging Markets where PSTN telephone connections can be limited and satellite connections expensive. Alternative last mile connectivity technologies such as wireless mesh networking also need to be implemented.

New Usage Models: From "One-to-One" to "One-to-Many"

The third challenge in enabling the next one billion users is moving beyond the traditional "One-to-One" PC usage model based on Individual Ownership to diverse "One-to-Many" models, whereby increasing numbers of people benefit from each computing appliance.

VIA Intrepid Computing envisions a world in which many millions more people are provided access to community-based computing and broadband resources at work, publicly funded locations such as schools and libraries, and Internet Cafés and Village Kiosks that are run on a "pay-per-use" basis by local entrepreneurs. Even in very poor or remote locations, where people cannot afford even basic computing and Internet access, subsidized digital broadcast stations can be established to provide the local population with relevant news and information on health, education, weather, and other vital subjects in audio and video formats.

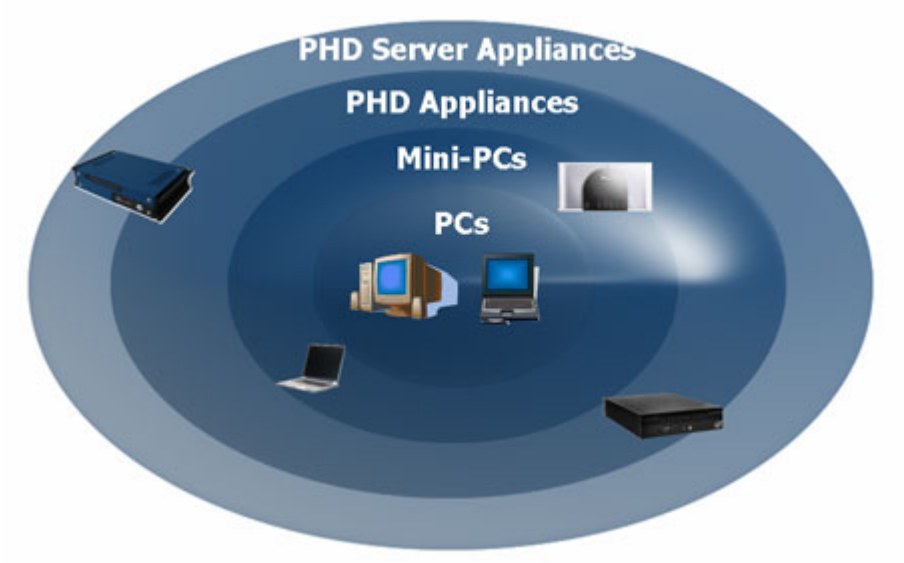
Figure 3: Expansion beyond Ownership Models to Access Models

New Products: From PCs to PHD Server Appliances

Creating the right products to meet the diverse requirements and usage scenarios of the next one billion users is the fourth major challenge, and requires moving beyond the confines of the traditional desktop and notebook PC.

The VIA Intrepid Computing Vision seeks to create new categories of innovative, energy-efficient devices with complete computing, multimedia, and connectivity features that can be tailor-made to meet the specific usage and environment needs of local markets, whether for space-constrained locations or to meet environmental issues of remote locations such as power, heat and dust (PHD).

Figure 4: Expansion beyond the PC to PHD Appliances



As illustrated in Figure 4 above, Intrepid Computing devices can be broken down into three major categories:

- **Mini-PCs:** Just like their counterparts in developed markets, consumers in Emerging Markets are demanding in their requirements and are looking for stylish yet robust and energy-efficient products that are small enough to fit in often space-constrained and crowded living environments but deliver a comprehensive set of computing, communications, and entertainment applications such as playing music and DVDs and VOIP telephony. The new wave of Mini-PCs provides a compelling solution to these requirements, and will contribute towards a significant expansion in Individual Ownership.

- **PHD Appliances:** PHD Appliances are an entirely new category of devices that move one step beyond the traditional PC and optimize it for Community Access and Assisted Access usage scenarios. PHD Appliances are highly energy-efficient in order to minimize the burden on the electricity generation infrastructure and are designed to operate in areas with intermittent electricity supply through the integration of support for a car battery, solar panels, and other alternative power sources. PHD Appliances are also designed to operate in the extreme ambient temperature ranges that are common in Emerging Markets, and have also been designed to protect against dust intrusion – a major cause of system failure in Emerging Market environments.

  To meet the diverse needs of Emerging Market Users, PHD Appliances are also “smart” in that they can be configured to a wide variety of different specifications and integrate support for local language software applications and connectivity services – thereby offering numerous value generation opportunities for local businesses.

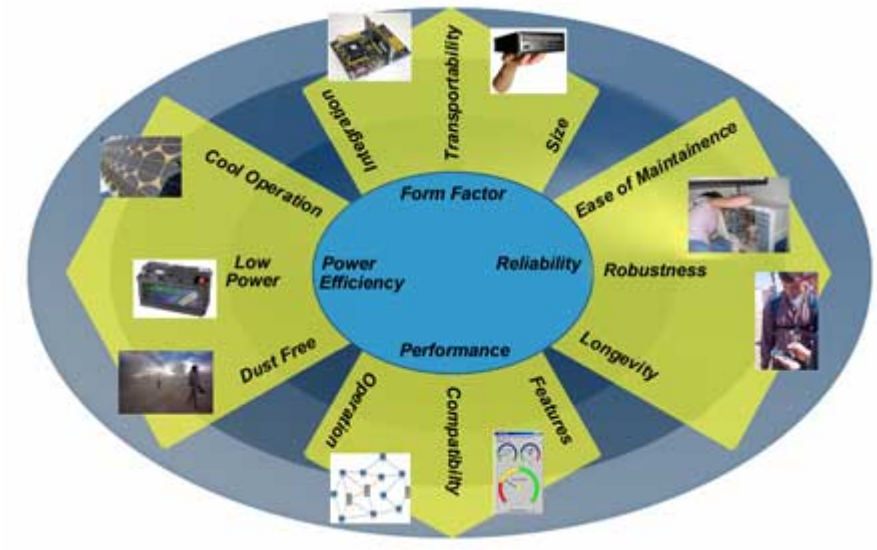
- **PHD Server Appliances:** PHD Server Appliances further extend the functionality of PHD Appliances by providing optimized solutions for digital

audio and video broadcasting stations in the harshest environments. They can also be used to set up wireless mesh networks and other last mile connectivity solutions in remote areas.

Intrepid Computing: Technology Challenges

Creating this new generation of Intrepid Computing Mini-PCs, PHD Appliances, and PHD Server Appliances for the next one billion users will require overcoming a number of key technical challenges, as summarized in Figure 5 below.

Figure 5: Technical Challenges for Intrepid Computing Devices



Reliability

Long-term, in-field reliability is essential to the sustainability and success of Intrepid Computing devices aimed at enabling the next one billion users. Systems need to be extremely robust so that they can operate in harsh environmental conditions and also withstand the inevitable rigors of being used in community deployments such as Internet Cafés and Village Kiosks. They also need to be easy to maintain in order to minimize service costs, and to have a long product life to maximize the return on investment in the devices.

Power Efficiency

Given the increasing cost of generating and distributing electricity and its intermittent availability in remote areas of many Emerging Markets, Intrepid Computing devices not only need to be significantly more energy-efficient than traditional PCs in order to reduce the burden on already inadequate electricity infrastructures, they also have to be able to operate using alternate power sources such as car batteries, solar panels, and even human power. For example, a 68-watt PHD Appliance can run for approximately twenty hours from a standard car battery, which, if recharged by solar panels, is capable of providing all-day operation.

Running costs are another critical issue that needs to be addressed, particularly for schools and other organizations with limited budgets and for Internet Café and Village Kiosk operators looking to maximize the return on their investments. Electricity costs for running a traditional PC consuming over 150 watts can be halved

by using more energy-efficient Intrepid Computing devices delivering equivalent levels of functionality and performance.

Cool operation, a function of low power, is also an essential element. Reducing the ambient temperature of the system minimizes the incidence of cracked solder joints and heat-loosened components that can accelerate system failure and unreliability. Accordingly, technology that does not require fans for cooling has a lower chance of in-field failure across all environments, and also helps to reduce static-induced damage to components caused by dust sucked into a system and circulated within it.

Form Factor

Reducing the physical size of the form factor of Intrepid Computing devices as well as making them more stylish and robust is another key challenge. The form factor needs to be small enough to fit into often very crowded living spaces, and reliable enough to withstand demanding environmental conditions, with the integration of, for example, dust protection covers.

In addition, smaller systems can not only lead to significant savings in transportation costs because of their smaller size, but can easily be more easily carried by more traditional forms of transportation such as horse carts, donkeys and camels that are still common in many remote regions.

One of the keys to reducing the form factor of a system is enabling the integration of more features on the motherboard of Intrepid Computing devices. This approach has the additional benefit of increasing overall reliability by minimizing or eliminating the need for add-in peripheral cards.

Performance

Balancing the need for energy efficiency and reliability with the ability to deliver advanced levels of functionality and performance - all within a small form factor – is the final technical challenge in developing Intrepid Computing devices.

In addition to standard computing programs such as productivity suites, web browsing and email, systems also need to be able to run advanced digital media applications such as 3D graphics, DVD playback, audio, and videoconferencing in order to meet the diverse needs of the user. This can only be achieved by a holistic approach to system design that integrates support for leading edge technologies at the platform level rather than placing all the overhead on the processor.

Intrepid Computing: Deployment Challenges

While creating the appropriate Intrepid Computing technologies and devices is a major step forward in enabling the next one billion users, successfully deploying them in Emerging Markets also represents a significant challenge, one that encompasses the following key areas summarized in Figure 6 below.

Figure 6: Deployment Challenges for Intrepid Computing Devices

Sustainability

If Intrepid Computing devices are to proliferate in the market, they need to be sustainable on an economic basis. As a result, they not only have to be affordable in terms of price, but also need to have a low Total Cost of Ownership that encompasses the cost of operation, cooling and maintenance as well as purchase price, and to be able to deliver a reasonable return on investment to individuals and organizations that purchase them and entrepreneurs that deploy them to deliver pay-for-use services.

Local Value Add

Intrepid Computing technologies and devices also need to be able offer significant opportunities for adding local value in the community in which they are being deployed and contribute to local economic development and national economic competitiveness. In addition to helping create business opportunities and jobs in building up community service and support infrastructures, including the establishment of manufacturing facilities, service centers, and kiosk operations, they also have to be able to drive opportunities for innovation in areas such as the localization of software and services.

By taking advantage of the experience gained in developing Intrepid Computing solutions appropriate for their local communities, companies and entrepreneurs may

also have the opportunity to further expand their business by exporting their products and expertise to other markets.

Manageability

Easy manageability is a key requirement for Intrepid Computing devices as support costs can grow exponentially as they are deployed in Emerging Markets, especially when they are being adopted by inexperienced users.

Ensuring easy manageability requires a radically different approach than the one adopted for traditional PCs. Devices need to be more reliable, with minimal critical points of potential failure, and also to have the capability to be managed remotely. Software applications and services should also be managed and delivered over the network, particularly when deployed in Community Access and Assisted Access usage scenarios, in order to reduce user complexity and minimize the risk of viruses and other malware applications.

User Experience

Intrepid Computing devices need to provide a compelling user experience such that users can recognize their value. As well as delivering a full set of productivity, entertainment, and connectivity applications, devices need to be able to offer content and services in local languages not just in text but also in high quality video and audio formats to fuel wider adoption.

Facilitating the growth of a natural ecosystem to create and deliver such localized applications, content, and services is an essential element of enhancing the user experience. The ability to empower local partners with a standardized x86 platform architecture for software and content development will play an equally critical role in speeding up the development of these ecosystems.

Intrepid Computing: Enabling the Next One Billion

Enabling the next one billion requires a bold new approach that goes beyond the boundaries of the traditional PC industry model – one that seeks to understand the diverse usage models and needs of Emerging Markets and to develop optimized technology and system solutions that meet these requirements.

Through the VIA pc-1 Initiative, VIA is leading the way in implementing its radical new Intrepid Computing vision that will help dramatically expand the global reach of ICT and open up exciting new opportunities for technology, product, and market innovation.